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Near-Merger in Russian Palatalization*

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Abstract: This study investigates the palatalized consonants of Russian in environments which prove difficult for second language learners of Russian. To this end, we conducted a production and a perception study. In the production experiment, native and nonnative speakers demonstrated different patterns of contrast. Results of the perception experiment are surprising because the nonnative speakers were able to distinguish more phonetic contrasts than native speakers. The native-speakers' performance provides supportive evidence of a 'near merger', where a contrast is maintained in production but lost in perception.

INTRODUCTION

In Russian, palatalized consonants contrast with plain, unpalatalized consonants. (Avanesov, 1972; Bolla, 1981; Zinder, *et al.*, 1964; Panov, 1964) The Russian palatalized consonants, however, also occur in sequences which American students of Russian find difficult to distinguish from bare palatalization. The sequences that we investigated contrast bare palatalized consonants with palatalized consonants followed by the palatal glide, and with palatalized consonants followed by the high front vowel followed by the palatal glide. We will call these the 'palatalized' (C^jV), the 'palatalized-plus-jot' (C^jjV) and the 'palatalized-i-jot' (C^ijV), respectively.

Of particular interest is the fact (which we will assume for the time being) that the contrast between palatalized-plus-jot sequences and palatalized-i-jot sequences, when stressed word-finally, is in a state of near-merger in Russian.[1] This contrast is rarely used to distinguish words and native-speakers intuitively feel that there is no real difference between them. We will present experimental evidence supporting this assumption. We will also argue that the acquisition of near-mergers (or at least this one) provides evidence that native-speakers and second language learners adopt very different perceptual strategies.

To anticipate our results, in an acoustic-phonetic production study of Russian plain (CV) and palatalized (C^jV, C^jjV, and C^ijV) consonants (totaling four sequence types) we found that learners did not distinguish all of the sequence types that native speakers do. However, in a perception study we found that native speakers failed to distinguish the palatalized-plus-jot and the palatalized-i-jot sequences (even though they did pronounce them differently) while our group of learners did attend to this distinction.

We will suggest that the native-speakers' behavior in the perception portion of the experiment reflects knowledge of the relative functional weight of the distinctions being

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1 We are using the term 'near-merger' in a relativey non-traditional way to refer to sequences which are spelled differently, pronounced slightly differently and judged by native speakers to not contrast.

investigated - that is, native-speakers do not treat a near-merger with the same attention that they reserve for normal contrasts. Thus, the native speakers listened 'linguistically' while the learners tended to listen 'phonetically'.

ACOUSTIC STUDY

METHODS

Thirty speakers participated in the production study. Sixteen (8 women, 8 men) were native speakers of Russian, and fourteen (8 women, 6 men) were American learners of Russian. These learners had studied Russian for at least 5 years and had lived in Russia for at least 4 months.

The speakers read a word list that was composed of near-minimal sets such as those illustrated in Table 1. Each set illustrated contrasts between a plain consonant, its palatalized counterpart, the palatalized consonant followed by the palatal glide, and the palatalized consonant followed by the high front vowel [i] and then the palatal glide. The word list contained 14 examples of each of these sequences in word-final stressed position, using the consonants [b, m, v, z, d, l, r] and vowels [a, u]. For each speaker and each C–V combination, only one repetition was analyzed.

C–V SEQUENCE TYPE	EXAMPLE WORD (in Russian)	EXAMPLE WORD (in transcription) 2	GLOSS
CV	тогда	tag'da	'then'
$C^{j}V$	судя	su'd^{j}a	'judging'
$C^{j}jV$	судья	su'd^{j}ja	'judge'
$C^{j}ijV$	судия	sud^{j}i'ja	'judge' (archaic)
CV	в углу	vu'glu	'in the corner'
$C^{j}V$	молю	ma'l^{j}u	'I pray'
$C^{j}jV$	налью	na'l^{j}ju	'I will pour'
$C^{j}ijV$	колею	kal^{j}i'ju	'rut' (Acc. sg)

Table 1. Example words from the list of materials used in this study.

There are very few minimal pairs illustrating the contrast between palatalized-plus-jot and palatalized-i-jot. And, as in the contrast between [sud^{j}ja] and [sud^{j}ija], it is often the case that the palatalized-i-jot member of a minimal pair is archaic. The functional load of the other contrasts though is higher. For example, there are numerous pairs such as [sud^{j}a] 'judging' and [sud^{j}ja] 'judge', [s^{j}el] 'he sat' and [s^{j}jel] 'he ate', [l^{j}ot] 'ice' and [l^{j}jot] 'she/he/it pours'. (Bryzgunova, 1963)

Speakers read each word in randomized order and then repeated the final consonant–vowel sequence in isolation. We took measurements from these final isolated productions and also used a subset of them in the perception study. To justify our decision of using the isolated productions, we initially took measurements from both the words and isolated productions for one Russian speaker and found no difference in the results.

2 Words are given in broad phonetic transcription.

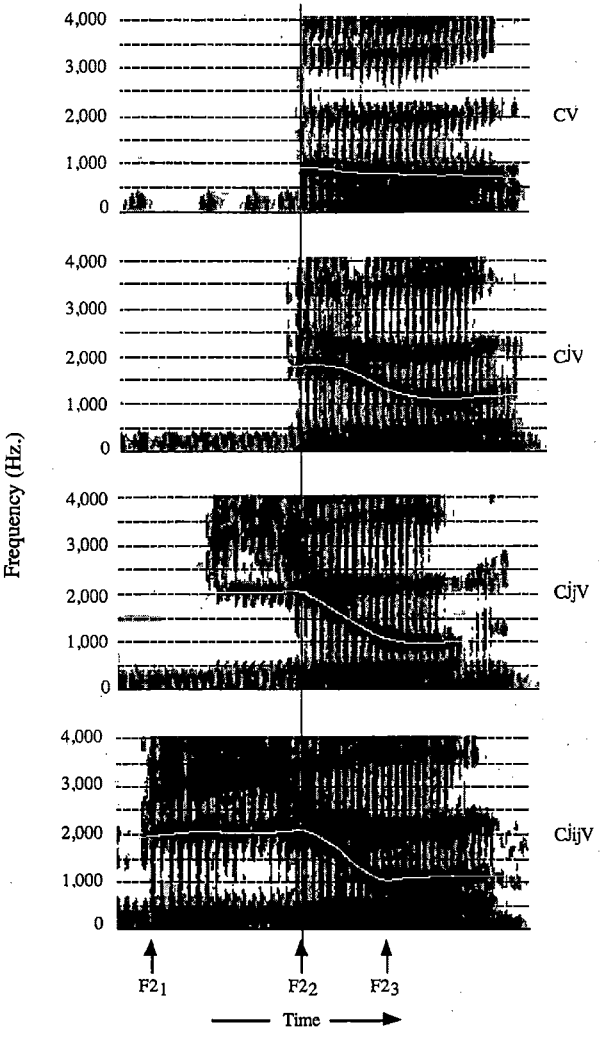

Figure 1. Sample spectrograms of the four C–V sequences. Spectrograms are aligned according to vowel onset as indicated by the continuous vertical line. The white lines were hand-drawn to show the center frequency. For each C–V sequence up to three F2 measurements ($F2_1$, $F2_2$ and $F2_3$) were made. The arrows below the last spectrogram ($C^{i}ijV$) indicate these three points of measurement.

We measured the frequency of the second formant at three points in time (see Figure 1). The first measurement ($F2_1$) was taken at the release of the primary occlusion of the consonant. Both the frequency of F2 and the temporal location of the release were noted. The second measurement ($F2_2$) was at the end of the relatively steady-state portion of F2, just prior to the transition to the following vowel. Finally we measured the F2 frequency and temporal location of the onset of the vowel steady-state ($F2_3$).

RESULTS

Figure 2 shows results for the male and female Russian and American speakers (see also Derkach *et al.*, 1970). The graphs show F2 trajectories for the palatalized, palatalized-plus-jot, and palatalized-i-jot sequences averaged across speakers, consonants and vowels.

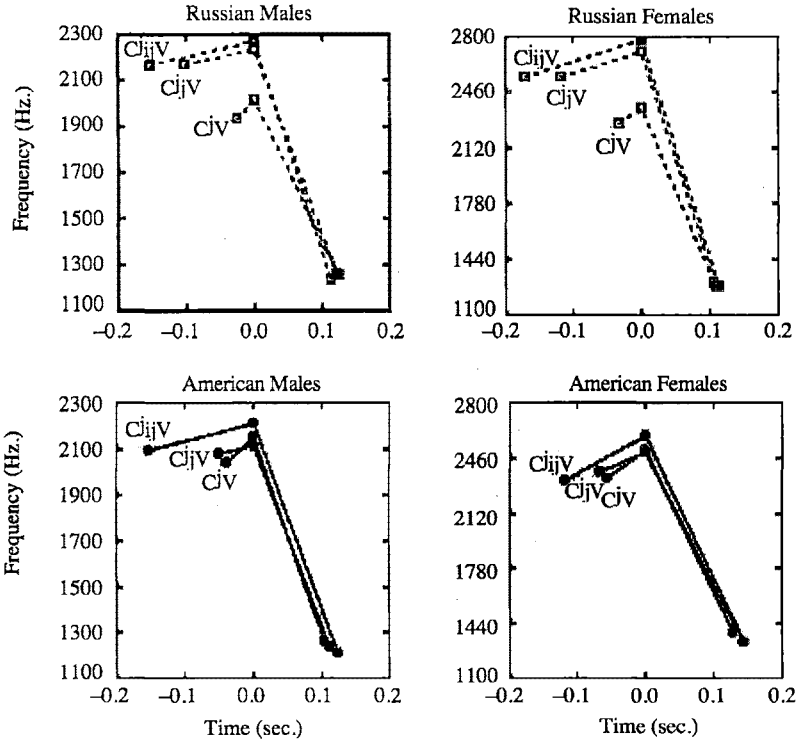

Figure 2. Results of the production study. Average F2 trajectories of the palatalized, palatalized-plus-jot, and palatalized-i-jot syllables are shown for each group of speakers. The trajectories are time aligned at the onset of the F2 transition to the following vowel.

For the Russian speakers, palatalized consonants had much shorter and lower frequency F2 steady-states than did either the palatalized-plus-jot, or the palatalized-i-jot sequences. Results of an ANOVA indicated that the steady-state durations are significantly different for both male and female Russian native speakers, [$F(2,14)=173.1$, $p<0.01$; $F(2,14)=268.5$, $p<0.01$, respectively] And, although the distinction between the palatalized-plus-jot and the palatalized-i-jot sequences is not large, a post-hoc Scheffe test indicated that there was a significant difference between the two, [for both male and female Russians all, $p<0.01$].

Turning now to the L2 learners, we see that the differences among the sequence types were much smaller than they were for the native speakers. Results of an ANOVA indicated that there was an overall significant difference in the F2 steady-state durations of the three C–V sequences of Americans' pronunciations for both males and females, [$F(2,10)=81.1$, $p<0.01$; $F(2,10)=61.9$, $p<0.01$, respectively]. However, an additional post-hoc Scheffe test indicated that there was not a significant difference in the F2 steady-state duration between the palatalized and the palatalized-plus-jot sequences, [$p>0.05$ for both males and females]. Results of this same post-hoc Scheffe test, however, did indicate that the Americans produced the palatalized-i-jot sequence with a longer F2 steady-state than in the other sequences, [$p<0.01$ for both male and female Americans].

In summary, this study showed that the L2 learners did not distinguish all of the palatalization contrasts that native speakers do, and that even though the distinction between palatalized-plus-jot and palatalized-i-jot does not carry much functional weight in Russian, native speakers do (at least in the speaking situation that we set up) maintain the distinction in production. Interestingly, the contrast that the L2 learners failed to produce is not the functionally weak contrast, but rather the more important (and perhaps less salient) contrast between palatalized consonants and the palatalized-plus-jot sequences.

PERCEPTION STUDY

METHODS

Forty-six listeners participated in the perception experiment. Eighteen (8 women, 10 men) were native speakers of Russian, and 28 (12 women, 16 men) were American learners of Russian. There was greater range of experience with Russian among the American listeners in this experiment, as compared with the Americans who participated in the production study. In a future report we will delve into the relationship between listeners' L2 experience and their performance in this study. In this report, however, we will discuss the American listeners as a group.

The speech samples presented to listeners were the productions of one (typical) male Russian speaker from the production study discussed above. We also included sequences with the vowel [i] in addition to [u] and [a]. The total number of stimuli presented to listeners was 252 consonant–vowel sequences, consisting of three repetitions of each of the 21 CV combinations of each of the four sequence types. The stimuli were presented in random order.

The listener's task was to identify each C–V sequence in a four-alternative forced-choice task. Prepared answer sheets listed each of the four sequence types (written in Russian) that were appropriate for a given C–V sequence. For example, if the test token was [bʲa] the alternatives listed were ба, бя, бья and бия ([ba], [bʲa], [bʲja], and [bʲija]).

RESULTS

Table 2 shows confusion matrices for both the Russian and American listeners. In these tables, stimuli and responses are coded according to sequence type. Data are summed

over listeners, consonants and vowels. The stimuli are shown in the rows and listeners' responses are listed in the columns. For example, of the 1134 presentations of non-palatalized consonants the Russian native-speaking listeners labeled 1130 of them correctly as non-palatalized, and 4 times heard a non-palatalized token as 'palatalized'.

RUSSIANS

Stimuli	Responses			
	CV	C^{j}V	C^{j}jV	C^{j}ijV
CV	**1130**	4		
C^{j}V		**1132**	2	
C^{j}jV		32	**1082**	16
C^{j}ijV	1	10	826	**296**

AMERICANS

Stimuli	Responses			
	CV	C^{j}V	C^{j}jV	C^{j}ijV
CV	**1575**	141	43	5
C^{j}V	152	**1288**	306	18
C^{j}jV	17	526	**908**	310
C^{j}ijV	16	106	264	**1378**

Table 2. Results of the perception text. The confusion matrices show responses (in columns) to the four types of stimuli (rows) for native Russian speakers and American learners of Russian.

The cells that are shown in bold are the correct responses. If there were no responses for a given stimulus/response pair the cell is left blank. Note that overall the Americans showed greater confusion than did the Russian native-speakers. This is apparent in the fact that there are no blank cells in the American confusion matrix.

Because there were unequal numbers of Russian and American listeners it is convenient to present the confusions in percentages rather than raw counts (see Table 3). These data indicate that though the American speakers made no distinction between the palatalized and palatalized-plus-jot in production, they were able to distinguish them, though imperfectly, in the speech of a Russian native speaker.

RUSSIANS

Stimuli	Responses			
	CV	C^{j}V	C^{j}jV	C^{j}ijV
CV	**99.6**	0.4		
C^{j}V		**99.8**	0.2	
C^{j}jV		2.8	**95.4**	1.4
C^{j}ijV	0.1	0.9	73.0	**26.0**

AMERICANS

Stimuli	Responses			
	CV	C^{j}V	C^{j}jV	C^{j}ijV
CV	**89.0**	8.0	2.4	0.3
C^{j}V	8.6	**73.0**	17.3	1.0
C^{j}jV	0.9	30.0	**51.5**	17.6
C^{j}ijV	0.9	6.0	15.0	**78.0**

Table 3. Results of the perception test. The data shown in Table 2 are presented here as percentages rather than counts.

However, perhaps the most striking aspect of these data is that the Americans scored 78% correct for the palatalized-i-jot sequences while Russian native speakers correctly identified these sequences only 26% of the time. These data are unusual among studies of L2 acquisition because they show a contrast that is perceived more accurately by second language learners than it is by native-speakers.

GENERAL DISCUSSION

Previous research has found that near-mergers tend to be characterized by a pattern in which the contrast is lost in perception but is maintained in production (see Labov, 1994, p. 357). This is exactly the pattern that we found for Russian native-speakers in the contrast between palatalized-plus-jot and palatalized-i-jot in this study. Because the contrast is characterized by maintenance of distinctiveness in production, but loss of distinctiveness in perception, we conclude that this is an example of near-merger.

In the course of this study we have also observed that American speakers merge the Russian palatalized and palatalized-plus-jot sequences in production perhaps because they produced the palatalized consonants as a sequence of a non-palatalized consonant followed by a palatal glide. We have discussed this aspect of these data in more detail elsewhere (Diehm, 1996).

Finally, the Americans' performance in the perception experiment indicates a lack of awareness of the near-merger of the palatalized-plus-jot and the palatalized-i-jot sequences. They attended to a phonetic contrast without regard to its linguistic status. The Russian native-speakers, on the other hand, treated the difference (which the Americans' performance shows was perceivable) as disregardable variation in what is essentially one category encompassing both types of sequence.

These data suggest that L2 learners may attend at a psychoacoustic level to phonetic phenomena which are ignored by native speakers. Future research will tell whether we have uncovered a general characteristic of second language perception.

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